PARASITES FROM TWO SPECIES OF SUCKERS (CATOSTOMIDAE) FROM SOUTHERN UTAH

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Abstract.— Twenty *Catostomus latipinnis* and 50 *Catostomus discobolis* from La Verkin Creek and the Fremont River in southern Utah were collected and surveyed for parasites. Data from the survey indicated that 83 percent of the fish were infected with at least one parasite, with the fish from La Verkin Creek harboring more parasites. Twelve genera and 12 species of parasites were identified from these fish. A monogenetic trematode, *Gyrodactylus elegans*, which was found in 90 percent of the fish, was the most common parasite. Comments are included on habitat and host variations for the parasitofauna from suckers taken from the two locations.

A survey of the parasites of the catostomids, *Catostomus latipinnis* and *C. discobolis*, was conducted at La Verkin Creek, southern Utah, and the Fremont River near Hanksville, Utah. The objectives of this survey were to provide a list of parasites for *C. discobolis* and *C. latipinnis* in La Verkin Creek and Fremont River and to correlate water parameters and benthos from these streams with parasite loads. Both streams contain well-established populations of the listed suckers. An exhaustive survey of parasites can explain the source or reservoir of serious pathogens for endangered species and commercially important fish.

Catostomids are found exclusively in North America, excluding two or three Asiatic species (Pflieger 1975). *Catostomus discobolis* is found in Idaho, Utah, and Nevada in the following drainages: Colorado River above the Grand Canyon, upper Snake River, Bear River, and Weber Lake outflows. *Catostomus latipinnis* is unique to the Colorado River drainage (Eddy 1959). Information concerning the life history of these two species is limited. Catostomid levels in both study areas for this project are maintained by resident sucker populations.

Both of the streams selected in this survey are unstable desert streams. Much of the substrate is sand which shifts and prevents deep pools from forming. Flash floods can disrupt and completely change the nature of the streams and change the macroinvertebrate population. Because of this, fish species, e.g., salmonids and centrarchids, that cannot withstand the instability of the stream and the consequent change in macroinvertebrate food source are not found extensively in these two streams. The ichthyofauna found in the study area of the Fremont River are: Longnose dace, *Rhinichthys cataractae*; speckled dace, *R. osculus*; leatherside chub, *Gila copei*; bluehead sucker, *C. discobolis*; and flannelmouth sucker, *C. latipinnis* (Heckmann 1976). The speckled dace and leatherside chub are omnivores that feed on aquatic plants, insects, and crustaceans. The flannelmouth suckers are herbivores which feed on algae, diatoms, parts of higher plants, and seeds. The bluehead sucker is a bottom feeder which scrapes algae and other organisms from rocks (Sigler and Miller 1963). The largest fish found in the Fremont River is the flannelmouth sucker and the smallest is the speckled dace. None of the fish found in the sample area are piscivorous. All fish feed either on aquatic invertebrates or plant material. Fish predators may include birds and small mammals.

Fish species inhabiting the survey site at La Verkin Creek are: speckled dace, *R. osculus*; Virgin River spinedace, *Lepidomeda mollispinis*; red shiner, *Notropus lutrensis*; woundfin minnow, *Plagopterus argentissimus*;

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flannelmouth sucker, *C. latipinnis*; bluehead sucker, *C. discobolis* or desert sucker, *C. clarki*; and rainbow trout, *Salmo gairdneri* (Winget and Baumann 1977). La Verkin Creek, in comparison to the Fremont River, is more stable and less turbid, resulting in the presence of riffles, pools, and some holes 1–1.5 m deep. Because of the difference in stream conditions, rainbow trout are planted by the Utah Division of Wildlife Resources in small numbers. Two species of fish, *L. mollispinis* and *P. argentissimus*, are considered endangered. The woundfin minnow, rainbow trout, and Virgin River spinedace are considered carnivores feeding mainly on invertebrates. *Catostomus discobolis* and *N. lutrensis* are considered bottom-dredging detritovores. *Catostomus latipinnis* and *R. osculus* are selective omnivores (Winget and Baumann, 1977). The top carnivore in a trophic scheme would be *S. gairdneri* because it may feed on smaller fish. Direct competition is virtually eliminated because those species with similar feeding habits have different habitat preferences or specific food preferences (Winget and Baumann 1977).

Parasites of catostomids other than *C. latipinnis* and *C. discobolis* have been studied by researchers in the United States and Canada. Hoffman (1967) lists known parasites for 12 species of catostomids. Other surveys have been conducted by Voth and Larson (1968), Amin (1969), Threlfall and Hanek (1970), Amin (1974), White (1974), Mackiewicz (1963), Price and Arai (1967), Dechtiar (1969), Daly and De Giusti (1971), Clifford and Facciani (1972), Hathaway and Herlevich (1973), Schell (1974), and Hayunga and Grey (1976). The most widely studied catostomids are white suckers, *C. commersoni*, and longnose suckers, *C. catostomus*. These surveys deal primarily with metazoan parasites, and little information concerning the protozoan parasites is included.

Materials and Methods

Through the use of electrofishing, 18 flannelmouth suckers and 40 bluehead suckers were collected from La Verkin Creek near the Toquerville cemetery, southern Utah. Two flannel-mouth suckers and 10 bluehead suckers were collected from the Fremont River one mile west of Capitol Reef National Park, near Hanksville, Utah. The fish were transported to Brigham Young University in iced holding tanks. Limited numbers of fish were obtained due to collecting restrictions.

Each fish was checked for parasites. The suckers were euthanized by a blow to the head before being weighed and measured (Table 1). Following macroscopic examination, scrapings of the surface, gills, medial area of the opercula, and eyes, were examined for parasites. Because the blood vessels were ruptured, gill scrapings were used to check for hemoflagellates. Intestine, liver, and gall bladder were excised and examined for endoparasites. The presence of metacercariae inhabiting the liver was checked by pressing a piece of the organ between two glass slides and examining it without magnification.

Protozoans were either air dried or preserved in 10 percent formalin. Permanent preparations of monogenetic trematodes were made with Turtox mounting and staining medium (nonresinous stain mountant CMC-S). Leeches were also fixed in formalin and all were identified through the use of keys listed in Hoffman (1967).

Cestodes were placed directly into AFA fixative to prevent total relaxation. Digenetic trematodes were placed in 95 C water to promote relaxation and then placed in AFA fixative. Cestodes and digenetic trematodes were stained with Semichon's carmine for 12 hours and then destained in changes of acid alcohol to improve color contrast. After destaining, the specimens were dehydrated in 95 percent and 100 percent ethyl alcohol for one hour each. Once dehydrated, specimens were cleared in xylene and then mounted with Permount on glass slides. Morphological characteristics given in Hoffman (1967) were used for identification of trematodes and nematodes. Preliminary identification of the caryophyllid tapeworms was confirmed by John S. Mackiewicz (State University of New York at Albany).

Water chemistry and macroinvertebrate data were obtained from studies by Heckmann (1976), Winget and Reichert (1976), and Winget and Baumann (1977).

RESULTS

Data from the examination of 40 bluehead and 18 flannelmouth suckers from La Verkin Creek in southern Utah indicated that 55 suckers harbored at least one species of parasite. Thirty-seven of 40 bluehead suckers were infected and all 18 flannelmouth suckers harbored parasites (Table 2). Postmortem examination of 12 suckers from the Fremont River revealed one of 10 bluehead suckers and 2 of 2 flannelmouth suckers were parasitized (Table 2).

Twelve genera and 12 species of parasites were identified from fish from La Verkin Creek. The most frequently encountered parasite was *Gyrodactylus elegans*, a monogenetic trematode which was found in 52 (90 percent) of the fish. Other monogenetic trematodes recovered were *Octomacrum lanceatum*, found in one (2 percent) fish, and *Pellucidhaptor alahamus*, found in six (10 percent) of the fish. Metacercariae of two digenetic trematodes were also recovered. *Neascus* sp. was found in 25 (43 percent) fish and *Clinostomum marginatum* was found in two (3 percent) fish. *Cystidicola* sp., a nematode, was found in one (2 percent) fish and *Monobothrium hunteri* and *Isoglaridacris hexacotyle*, both caryophyllid cestodes, were found in 29 (50 percent) and 28 (48 percent) fish, respectively. Three protozoans were recovered from the fish. *Myxosoma* sp. was found in 11 (19 percent) fish, *Myxidium* sp. in four (7 percent), and *Trichondina* sp. was found in 20 (34 percent) of the fish examined (Table 3).

TABLE 1. Weights and measurements of fish examined.

No.	Species of fish	Stream	Weight (gm)	Length (TL) (cm)
1	*C. discobolis*	La Verkin Creek	45	17
2	"	"	43	14
3	"	"	38	16
4	"	"	33	15
5	"	"	33	14
6	"	"	55	18
7	"	"	65	19
8	"	"	50	16
9	"	"	40	16
10	"	"	25	13
11	"	"	35	16
12	"	"	50	16
13	"	"	60	18
14	"	"	85	21
15	"	"	90	21
16	"	"	45	17
17	"	"	20	13
18	"	"	40	16
19	"	"	40	16
20	"	"	40	17
21	"	"	15	11
22	"	"	45	17
23	"	"	30	14
24	"	"	35	15
25	"	"	25	13
26	"	"	55	17
27	"	"	20	13
28	"	"	35	16
29	"	"	30	16
30	"	"	45	17
31	"	"	20	13
32	"	"	25	14
33	"	"	25	14
34	"	"	30	15
35	"	"	25	15

Table 1 continued.

No.	Species of fish	Stream	Weight (gm)	Length (TL) (cm)
36	*C. discobolis*	La Verkin Creek	30	15
37	"	"	45	17
38	"	"	15	11
39	"	"	20	13
40	"	"	20	13
41	*C. latipinnis*	"	115	24
42	"	"	180	27
43	"	"	185	27
44	"	"	230	30
45	"	"	205	29
46	"	"	260	32
47	"	"	210	30
48	"	"	125	25
49	"	"	185	29
50	"	"	260	31
51	"	"	225	24
52	"	"	110	24
53	"	"	195	23
54	"	"	130	25
55	"	"	170	28
56	"	"	125	24
57	"	"	105	24
58	"	"	85	22
59	*C. discobolis*	Fremont River	20	14
60	"	"	10	11
61	"	"	35	16
62	"	"	35	17
63	"	"	20	14
64	"	"	30	16
65	"	"	5	10
66	"	"	25	15
67	"	"	10	11
68	"	"	30	15
69	*C. latipinnis*	"	530	40
70	"	"	350	37

Differences in protozoan parasite load from the two species of fish taken from La Verkin Creek are as follows: *Myxosoma* sp., 25 percent bluehead suckers and 6 percent flannelmouth suckers; *Myxidium* sp., 0 percent bluehead suckers and 22 percent flannelmouth suckers; *Trichodina* sp., 80 percent bluehead suckers and 22 percent flannelmouth suckers were infected. For the metazoan parasites, *G. elegans* was found in 90 percent of the bluehead suckers and 89 percent of the flannelmouth suckers. *Octomacrum lanceatum* and *P. alahamus* were found exclusively on bluehead suckers, 3 percent and 6 percent, respectively. *Neascus* sp. was found on 28 percent of the bluehead suckers and 78 percent of the flannelmouth suckers, but *C. marginatum* was found only in 11 percent of the flannelmouth suckers. The flannelmouth suckers have a higher incidence of both species of caryophyllid cestodes. *Monobothrium hunteri* was found in 38 percent of the bluehead suckers and 78 percent of the flannelmouth suckers, and *I. hexacotyle* was found in 33 percent of the bluehead suckers and 83 percent of the flannelmouth suckers. The nematode *Cystidicola* sp. and the leech *Piscicola* sp. were symbiotic exclusively to the bluehead suckers. Three percent of the fish were infected with each of these two parasites.

One species of parasite was recovered from

TABLE 2. Number and percentage of bluehead and flannelmouth suckers parasitized from La Verkin Creek and the Fremont River.

Host species	Total fish sampled	Total fish parasitized	La Verkin Creek fish parasitized[a]	Fremont River fish parasitized[b]
Bluehead sucker	50	38 (76%)	37 (93%)	1 (10%)
Flannelmouth sucker	20	20 (100%)	18 (100%)	2 (100%)
Total	70	58 (83%)	55 (95%)	3 (25%)

[a]58 fish examined from La Verkin Creek: 40 bluehead and 18 flannelmouth suckers.
[b]12 fish examined from the Fremont River: 10 bluehead and 2 flannelmouth suckers.

TABLE 3. Parasites identified from 58 suckers from La Verkin Creek.

Parasite species	Number and percentage of fish positive	Species of fish	
		Bluehead	Flannelmouth
Protozoans			
Myxosoma sp.	11 (19)	10 (25%)	1 (6%)
Myxidium sp.	4 (7)	0 (0%)	4 (22%)
Trichodina sp.	20 (34)	16 (80%)	4 (22%)
Trematodes			
Gyrodactylus elegans	52 (90)	36 (90%)	16 (89%)
Octomacrum lanceatum	1 (2)	1 (3%)	0 (0%)
Pellucidhaptor alahamus	6 (10)	6 (15%)	0 (0%)
Postodiplostomum minimum	25 (43)	11 (28%)	14 (78%)
Clinostomum marginatum	2 (3)	0 (0%)	2 (11%)
Cestodes			
Monobothrium hunteri	29 (50)	15 (38%)	14 (78%)
Isoglaridacris hexacotyle	28 (48)	13 (33%)	15 (83%)
Nematodes			
Cystidicola sp.	1 (2)	1 (3%)	1 (0%)
Leeches			
Piscicola sp.	1 (2)	1 (3%)	0 (0%)

the fish examined from the Fremont River (Table 4). *Gyrodactylus elegans* was identified in 25 percent of the fish examined. Ten percent of the bluehead suckers were infected with this monogentic trematode, and 100 percent of the flannelmouth suckers were infected.

Table 5 lists the preferred tissue in the host for each parasite. These parasites were found in only five areas of the fish. Eight of the parasite species were found on the external surface and only four were found in more than one area.

DISCUSSION

There are habitat and host variations for the parasitofauna from suckers taken from La Verkin Creek and Fremont River. The catostomids from La Verkin Creek were more heavily parasitized, both in the number of fish infected and in the number of species encountered, than were the fish from Fremont River. Explanation for these differences may be attributed to many factors, such as water quality and macroinvertebrates. Water chemistry for the two streams was found to be similar except during spring runoff.

Oligocheates, which usually act as the intermediate hosts for caryophyllid tapeworms (Mackiewicz 1972), occur in both streams. Recent studies listed 14,203 (Winget and Baumann 1977) and 882 (Heckmann 1976) oligocheates per m^2 in La Verkin Creek and Fremont River, respectively, where the fish for this study were obtained. The number of oligocheates should not have caused the difference in parasite load because infected worms would have been ingested by fish from both streams. Milbrink (1975) correlates

TABLE 4. Parasites identified from 12 suckers from the Fremont River.

Parasite species	Number and percentage of fish positive	Species of fish	
		Bluehead suckers	Flannelmouth suckers
Trematodes			
Gyrodactylus elegans	3 (25)	1 (10%)	2 (100%)

TABLE 5. Location in host of parasites found in fish from La Verkin Creek and the Fremont River.

Parasite species	Surface	Gills	Operculum	Intestine	Gall bladder
Protozoans					
Myxosoma sp.	*	*	*	o	o
Myxidium sp.	o	o	o	o	*
Trichodina sp.	*	*	o	o	o
Trematodes					
Gyrodactylus elegans	*	*	o	o	o
Octomacrum lanceatum	*	o	o	o	o
Pellucidhaptor alahamus	*	o	o	o	o
Clinostomum marginatum	*	*	o	o	o
Cestodes					
Monobothrium hunteri	o	o	o	*	o
Isoglaridacris hexacotyle	o	o	o	*	o
Nematodes					
Cystidicola sp.	o	o	o	*	o
Leeches					
Piscicola sp.	*	o	o	o	o

* = present
o = not present

the caryophyllid worm burden of fish with the number of infective oligocheates consumed. If the Fremont River contained infected oligocheates, some of the fish sampled should have been infected.

The geographical location of the two streams may have caused the difference in parasite load. Parasites can be found in one area but not in another even though both have similar aquatic characteristics. *Myxosoma cerebralis*, a myxosporidan parasite which caused whirling disease in trout, has been reported in eight states (American Fisheries Society, 1974). Whirling disease has not spread to the other states even though suitable habitats exist. *Diplostomum spathaceum*, the eye fluke of fish, has been reported in some areas of Utah but not others (Palmieri, Heckmann, and Evans 1976).

Most parasites have some effect on the health of the host (Olsen 1974). The fish sampled from the Fremont River were infected with only one species of parasite, *Gyrodactylus elegans*, and the incidence of that parasite was low in comparison to infected fish from La Verkin Creek. The most common parasite found on the fish from La Verkin Creek is *G. elegans*. This organism was on the surface and occasionally in gill scrapings. Large numbers of *G. elegans* can cause damage to the fish by physical blockage of the gill surface, thus interfering with the gas exchange area (Hoffman 1967). Other monogenetic trematodes, *Octomacrum lanceatum* and *Pellucidhaptor alahamus*, and the protozoan, *Trichodina* sp., are capable of causing similar problems in the fish. These parasites were not found in great enough quantities to pose a threat at the present time. The two myxosporidans, *Myxosoma* sp. and *Myxidium* sp., are capable of encysting and destroying tissue. However, no cysts were found. Thus, it is assumed that these myxosporidans are causing little damage to the fish.

The fact that no hemoflagellates were found during the course of this study does not disprove their existence in these fish, because some of these parasites have seasonal fluctuation.

Only one nematode, *Cystidicola* sp., was recovered from all fish examined in the survey. This round worm is not detrimental to the fish unless it is found in high numbers (Hoffman 1967). The other intestinal helminths, *Monobothrium hunteri* and *Isoglaridacris hexacotyle*, are adult cestodes that usually cause little damage to the definitive host. High numbers (200 plus) result in mechanical blockage or cause nutritional deficiencies (Mackiewicz 1972). The adult worms adhere to the intestinal lining by means of suckers. There is little intestinal damage by individual cestodes because the scolex is unarmed.

The metacercariae of *Neascus* sp. and *Clinostomum marginatum* were recovered from suckers from La Verkin Creek. For these trematodes, the metacercarial stage is usually encysted in the second intermediate host and does not cause damage through migration (Hoffman 1967). Unless the metacercaria is encysted in vital organs, such as a parasite in the eye lens (*D. spathaceum*), it does not present a pathogenic health problem to the fish. (*Neascus* sp. was observed encysted in the fins and gills. The cysts found in the gills were not numerous and did not appear to interfere with gas exchange for the fish.

The leech, *Piscicola* sp., did not present a current problem to the fishing that only one specimen was recovered. Leeches are periodic feeders and should not attach permanently to the host. The major problem with leeches on fish is due to large numbers on one host or the transmitting by hemoflagellates (blood parasites) (Hoffman 1967). No blood parasites were found during this survey.

None of the fish expired during the journey from their natural habitat, approximately 400 km, to holding tanks. Thus, it is assumed that the effects of all the parasites on the suckers were not evident when the fish were placed under stress of capture and transportation.

Limited host specificity is demonstrated by the parasites recovered in this survey. Most of the parasites encountered have been reported in other species of fish (Hoffman 1967). Species of *Myxidium*, *Myxosoma*, *Trichodina*, *Cystidicola*, and *Piscicola* have all been reported in trout. The parasitic species found in salmonids may be different than those found in the suckers. *Gyrodactylus elegans* and *P. minimum* have also been reported in salmonids. *Octomacrum lanceatum* has been reported in the catostomids, *Catostomus teres*, *C. commersoni*, *C. macrocheilus*, and *Erimyzon sucetta*, the cyprinids, *Mylocheilus*

caurinus (peamouth), and *Notropis cornutus* (common shiner). *Pellucidhaptor alahamus* has been reported in *Ictiobus bubalus*, the smallmouth buffalo (Chien and Rogers 1970). The caryophyllid tapeworms, *M. hunteri* and *I. hexacotyle*, common to *C. discobolis* and *C. latipinnis*, have both been reported from other catostomids (Hoffman 1967). Because the parasites recovered in this study have been reported in other species of fish, it is possible that these parasites may infect game fish or commercially cultured fish. In the case of the listed digenetic trematodes, infected birds can fly from one body of water to another and "seed" other streams and ponds. Also, currents can carry infected fish and other intermediate hosts downstream to contaminate the lower drainage system. Thus, potential infections of other fish in the same stream could threaten endangered species such as the woundfin minnow and the Virgin River spinedace, which are also found in La Verkin Creek.

The identity of one of the hosts from La Verkin Creek is doubtful. Originally, it was classified as a chiselmouth sucker (Sigler and Miller 1963). Later studies considered this catostomid a desert sucker (*C. clarki*), which is still a valid species (Bailey et al. 1970). Then, with the taxonomic revision of some of the members of the catostomid family, *Pantosteus delphinius*, the bluehead sucker, and *P. virescens*, the green sucker, were combined to form *C. discobolis* (Bailey et al. 1970). After this revision some investigators have considered the fish as *C. discobolis*. Because of the anatomical similarities between *C. discobolis* and *C. clarki* and the activities and feeding habits, the two could be considered similar. It may also be concluded that they could harbor similar parasites even if they are two distinct species.

Of the two suckers, *C. latipinnis* is more selective in its feeding habits than is *C. discobolis*. Winget and Baumann (1977) reported stomach contents of the flannelmouth sucker contained seeds, identifiable plant matter, and dipteran larvae; stomachs of the bluehead sucker contained detritus, unidentifiable plant matter, and very few macroinvertebrates. The difference in feeding habits of these two fish is probably the reason for the difference in resident parasite species. The parasites that these two fish have in common may be due to the ingestion of a common intermediate host. Even though *C. latipinnis* is more selective in its feeding habits, it still would ingest detritus and other material due to its feeding technique.

The parasites identified in this survey are not unexpected. Although no parasitic surveys of *C. discobolis* and *C. latipinnis* have been reported, *Myxosoma* sp., *Myxidium* sp., *Trichodina* sp., *G. elegans*, *O. lanceatum*, *P. alahamus*, *P. minimum*, *C. marginatum*, *I. hexacotyle*, *M. hunteri*, *Cystidicola* sp., and *Piscicola* sp. have all been reported from suckers (Hoffman 1967).

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